



# Nutrition and its Effect on Bee Management

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The success of beekeeping depends on strong, vigorous colonies. Colonies can only develop large populations when the queen maintains a high egg-laying rate and when there are sufficient stores of pollen and honey. When nectar and pollen sources are not available, supplemental feeding can maintain colony development.

The amount of bee brood raised by a colony is dependent on the number of nursing bees present. When supplemental feeding is provided, a delay can be expected until the population increases. A broodless colony, such as a package, will require about 12 weeks to reach a population of 30,000 bees. When some brood rearing already took place at the time of feeding, such a population could be reached in 6 weeks.

While supplemental feeding stimulates brood rearing, it cannot induce colonies to respond faster than their biology permits. The beekeeper must therefore offer supplemental feeding well before maximum populations are required.

Other factors that influence populations development include egg-laying rate of the queen, worker longevity, management, absence of disease, and environmental factors.

## Type of Nutrition

There are three components of honeybee nutrition:

- carbohydrates
- protein (including fats), minerals, and vitamins
- water

In nature, the honeybee colony meets its carbohydrate requirements from nectar or honeydew. A shortage of carbohydrates may result in a reduction in brood rearing and in some cases it may lead to starvation. Starvation is one of the most common causes of colony death.

Protein is obtained from pollen. Prolonged shortages of pollen will result in the reduction or cessation of brood rearing. Colonies are generally not affected during short periods of pollen dearth.

Water is essential to the honeybee colony. Beekeepers often fail to recognize the importance of the availability of clean, fresh water nearby. This is especially important in B.C.'s interior and areas with long, cold winters. Colonies should have access to a reliable, clean water source during the beekeeping season. To prevent the bees of going to the neighbor's swimming pool, a shallow basin with sand or floatation materials near the apiary should be made available from the beginning of the season.

## A. Carbohydrates

Honeybees collect nectar as their principal carbohydrate source. Nectar is a sugar solution of between 5 to 75% solids. The major sugars include sucrose, dextrose (glucose) and levulose (fructose). Foraging bees temporarily store nectar in their honey stomach where it is inverted by the enzyme invertase from sucrose into dextrose and levulose. After her return to the hive, the bee will regurgitate the processed nectar where most of the water will be removed through evaporation. The final product is honey that consists of about 17% water, 38% levulose, 31% dextrose, 1 % sucrose, and 13% other sugars.

In times of dearth, nectar substitutes can be fed to the colony. The most common substitutes are white table sugar (sucrose), or high fructose corn syrup (HFCS) which is a converted starch product. HFCS is currently only available in large bulk quantities, and not suitable for most beekeepers. White sugar is the most common form of feed supplement. There is no difference between cane and

beet sugar, but brown sugars should be avoided because they contain non-digestible components.

During the course of the year, the beekeeper should be prepared to feed bees in fall and spring and in case of emergency. Fall feeding is the most important time to feed bees, because;

- **Produce strong colonies for winter.** Late splits and small colonies prepared for winter will be stimulated by the feeding, resulting in good age distribution of the bee population.
- **Prevent winter starvation.** Honeybee colonies do not die of the cold, but starvation. Insufficient feed in the fall may cause the winter cluster to lose access to stored food reserves. Even with plenty of feed, the risk of starvation can never be completely eliminated. Some colonies may not conserve reserves well, especially when winter has been marked by frequent warm spells.
- **Replace harvested honey.** Some beekeepers remove all honey in the fall and replace it with sugar syrup. Unless there is a threefold difference in the price of sugar and honey, the practice is not recommended. Please be aware that bees expend energy to process sugar syrup before storing. This task may require the energy equivalent of as much as 25% of the sugar being fed.
- **Eliminate spring feeding.** Sufficient fall feeding will eliminate or reduce the need for spring feeding. Abundant stores of honey and pollen is the stimulus for brood rearing, not a dribble of spring syrup. However, colonies weak in the spring respond favorably to sugar syrup feeding.

## B. Protein

Pollen is not only the principal protein source to bees, it also provides vitamins, minerals and fats essential for the development of brood and young adult bees. The protein content of pollen can vary from 7 to 30% (by weight) with an average of about 22%.

Longer periods of insufficient protein will affect the entire colony, resulting in reduced egg laying and brood development. Young nursing bees may not fully develop their hypopharyngeal glands, causing insufficient production of brood food. This in turn may lead to spotty brood patterns that are often misdiagnosed as the result of a failing queen. To offset any pollen shortages, pollen supplements or substitutes can be given. Pollen supplements will not necessarily cause the bees to reduce pollen collection in the field.

The rate at which bees consume the pollen supplement is influenced by its location in the hive relative to the brood cluster. Nurse bees should have ready access to the pollen supplement. The greatest consumption takes place directly above and to the sides of the brood area. Pollen substitutes (such as Brewer's Yeast, soya flour, etc.) are more readily accepted when natural pollen is added.

## Feeding Formulations

The most effective pollen substitutes and supplements are those that most closely resemble the chemical and physical composition of stored pollen. Brewer's Yeast is very similar to the protein content of the average pollen and superior in vitamins. Yet, pollen substitutes are never as attractive and nutritious as the best pollens.

For Formulations of Pollen Supplements and Substitutes, please refer to Bulletin #411-Pollen Substitutes and Supplements.